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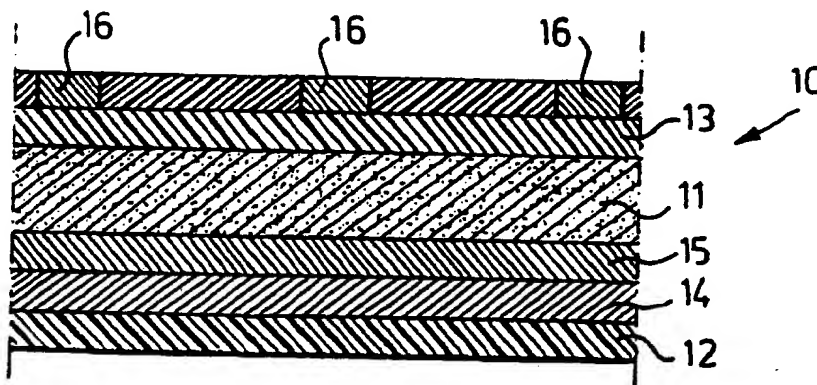
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(21) International Application Number: PCT/SE98/00870 (22) International Filing Date: 12 May 1998 (12.05.98) (30) Priority Data: 9701788-3 14 May 1997 (14.05.97) SE (71) Applicant (for all designated States except US): TETRA LAVAL HOLDINGS & FINANCE S.A. [CH/CH]; Avenue Général-Guisan 70, CH-1009 Pully (CH). (72) Inventors; and (75) Inventors/Applicants (for US only): LASSON, Rolf [SE/SE]; Rudeboksvägen 307, S-226 55 Lund (SE). KARLSSON, Christer [SE/SE]; Admiralvägen 7, S-237 32 Bjärred (SE). JOHANSSON, Kaj [SE/SE]; Sonarp 757, S-260 24 Röstänga (SE). PUSZTAI, Zoltan [SE/SE]; Tamburinvägen 17, S-245 42 Staffanstorps (SE). (74) Agent: SUNDELL, Håkan; AB Tetra Pak, Ruben Rausing's gata, S-221 86 Lund (SE).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>

(54) Title: A METHOD OF PRODUCING A PRINTING INK-DECORATED PACKAGING MATERIAL, IN PARTICULAR FOR ASEPTIC PACKAGES

(57) Abstract

The disclosure relates to a method of producing a printing ink-decorated packaging laminate for aseptic packages of the type which is produced in that a web of the packaging laminate is, for the purpose of sterilization, led through a bath of hydrogen peroxide prior to the reforming of the web into aseptic packages. The packaging laminate is produced in that a web of paper which has an outer coating of low density polyethylene (LDPE) is, for the purposes of promoting adhesion, subjected to a corona treatment modifying its polarity,

whereafter the thus treated outer LDPE coating is provided with décor of water-based printing ink which is applied in the desired pattern on the outside of the coating. By subjecting the thus printing ink-decorated web to a surface energy-reducing after treatment, there will be obtained a packaging laminate which is susceptible to sterilization with considerably reduced consumption of hydrogen peroxide, at the same time as good adhesion between the water-based printing ink décor and the outer LDPE coating is ensured.



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A METHOD OF PRODUCING A PRINTING INK-DECORATED PACKAGING MATERIAL, IN PARTICULAR FOR ASEPTIC PACKAGES

TECHNICAL FIELD

5 The present invention relates to a method of producing a printing ink-decorated packaging material of laminate type, comprising one outer coating of plastic which serves as décor carrier and which has, on its outside, applied décor of water-based printing ink, in which method a web of rigid, but foldable paper which, at least on its one side, has an outer coating of plastic
10 serving as décor carrier, is subjected, for the purpose of promoting adhesion, to a surface treatment modifying its polarity, by means of electric corona discharges, and in which method the thus surface treated outer plastic coating of the web is thereafter provided with décor of water-based printing ink which, using conventional printing technique, is applied in any optional
15 pattern on the outside of the surface-treated plastic coating.

 In particular, the present invention relates to a method of producing such a printing ink-decorated packaging material of laminate type for aseptic packages which are produced from a web of the packaging material which, for the purpose of sterilization, is led through a bath of aqueous hydrogen
20 peroxide prior to the reforming of the web into finished, aseptic packages.

BACKGROUND ART

 In the packaging industry, use is often made of liquid-tight, dimensionally stable packages of the single use disposable type for packing
25 and transporting liquid foods.

 Single use disposable packages of the type under consideration here are typically produced from a packaging material of laminate type comprising a rigid, but foldable core layer of paper which, at least on its one side, has an outer coating of plastic which serves as the décor carrier and
30 which is preferably low density polyethylene (LDPE) having, applied on its outside, décor of water-based printing ink. Preferably, the core layer also has an outer coating of plastic, normally low density polyethylene (LDPE) on its other side as well, whereby the packaging material makes for the production of dimensionally stable, liquid-tight packages by means of simple, effective
35 thermosealing.

 In certain cases, in particular when the packaging material is to be

employed for so-called aseptic packages, the packaging material is also provided with a material layer which serves as gas barrier and is disposed between the core layer and that one of the two outer plastic coatings which is intended to be turned to face inwards when the packaging material is reformed into packages. The material in this gas barrier layer may be a so-called barrier polymer, for example polyamide, or ethylene vinyl alcohol copolymer, but most generally consists of an aluminium foil (so-called Alifoil).

Nowadays, dimensionally stable, liquid-tight packages are most generally produced with the aid of modern, high-speed packing and filling machines of the type which, either from a web or from prefabricated sheet blanks of the packaging material, form, fill and seal the packages. From, for example a web, the packages are produced in that the web is first reformed into a tube by both longitudinal edges of the web being united with one another in an overlap joint seal. The tube is filled with the relevant contents, for example liquid food, and is divided into closed, filled packages by repeated transverse seals transversely of the longitudinal axis of the tube below the level of the contents in the tube. The packages are separated from one another by incisions or cuts in the transverse sealing zones and are given the desired geometric, normally parallelepipedic configuration, by a further forming and sealing operation for the formation of the finished packages.

So-called aseptic packages are produced fundamentally in the same manner, but with the crucial difference that both the packaging material and the relevant contents are sterilized prior to the filling phase, and that the filling phase takes place in a sterile (aseptic) filling atmosphere so as to avoid reinfection of the sterilized contents.

A sterilization of the packaging material often takes place with the aid of a chemical sterilizing agent, for example an aqueous solution of hydrogen peroxide, with which the packaging material is brought into contact for destroying unwanted, in particular pathogenic micro-organisms on at least those parts of the packaging material which come into contact, or risk coming into contact with the sterilized contents. However, the entire packaging material is often sterilized in that a web of the packaging material is led down into and through a bath of aqueous hydrogen peroxide which, for the above-mentioned purpose of sterilization, is allowed to act on the packaging material web prior to reforming of the web into aseptic packages

as described above.

Printing inks for the described application in connection with packaging materials are often water-based and therefore require that the surface on which they are to be applied is sufficiently hydrophilic to achieve
5 good adhesion between the water-based printing ink and the relevant printing surface.

A surface of polyethylene, e.g. LDPE, which is used as printing surface in the above described prior art packaging material is, however, hydrophobic (water repellent) and must therefore be modified in order to
10 make for the desired good adhesion between printing ink and printing surface. For the purpose of promoting adhesion, the packaging material according to the prior art technique is therefore subjected to a surface treatment which changes its polarity by means of electric corona discharges, as a result of which the polyethylene surface obtains the desired hydrophilic
15 character.

While it has thus previously been possible to produce a printing ink-decorated packaging material of the type described by way of introduction with good adhesion between the water-based printing ink and the outer polyethylene coating of the packaging material, it has surprisingly proved
20 that the prior art packaging material, in particular for aseptic packages, may be improved considerably using only simple means.

OBJECT OF THE INVENTION

One object of the present invention is therefore to indicate how such
25 an improved packaging material, in particular for aseptic packages may be produced in a simple manner.

SOLUTION

This object is attained according to the present invention by a method
30 according to independent Claim 1 which, according to a particularly advantageous embodiment of the present invention, has been given the characterizing features as set forth in independent Claim 5.

OUTLINE OF THE INVENTION

35 By subjecting the printing ink-applied web of packaging material to a surface energy-reducing after treatment, as in the method according to the

present invention, it is possible to produce a printing ink-decorated packaging material which not only withstands storage in a damp environment even for lengthy storage times, without the décor losing its clarity and freshness, but which also can be sterilized using aqueous hydrogen peroxide, as described above, with considerably lower consumption of hydrogen peroxide than has hitherto been possible using the prior art methods.

One explanation for the above described drawbacks inherent in the prior art printing ink-decorated packaging material, i.e. moisture sensitivity on storage and excessively high hydrogen peroxide consumption in connection with sterilization, may be that a corona treatment, at the same time as it realises modification (change of polarity) of the décor-carrying polyethylene coating of the packaging material, is sufficiently powerful that the polyethylene coating is "broken up" when it is hit by the electric corona discharges. Within such "broken up" regions the polyethylene coating wholly or partly lacks hydrophilic seats which are required for the water-based printing ink to adhere with good adhesion, as a result of which the printing ink thus only partly adheres within these regions. The risk of interaction between printing ink and moisture or liquid and consequential deterioration in the quality of the applied décor has thus increased within the above mentioned regions.

The problem with "broken up" material regions of the outer polyethylene coating of the packaging material becomes particularly serious when the packaging material is, for the purpose of sterilization, led through a bath of aqueous hydrogen peroxide, as in the production of aseptic packages. Apart from the fact that the printing ink comes into contact and interacts with the water in the hydrogen peroxide solution, hydrogen peroxide will be excessively attracted and absorbed by exposed hydrophilic seats in the polyethylene coating also in regions outside the applied printing ink décor, with excessive hydrogen peroxide consumption as a result.

By subjecting the corona-treated outer polyethylene coating of the packaging material to a surface energy-reducing after treatment by means of heat, the above described drawbacks in connection with the prior art packaging material are thus effectively obviated.

Preferably, the surface energy-reducing after treatment is carried out by means of hot press rollers or press cylinders between which the

packaging material is led, whereby a physical levelling effect on the "broken up" polyethylene coating is also achieved, which, together with the reduced surface energy, further contributes in counteracting the tendency of the corona-treated polyethylene coating to absorb liquid (water).

5

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWING

The present invention will now be described in greater detail hereinbelow, with particular reference to the accompanying Drawing, in which:

10 Fig. 1 is a schematic a cross section of a per se known packaging material for aseptic packages, which is produced employing the method according to one particular embodiment of the present invention; and

Fig. 2 schematically illustrates the production of the packaging material illustrated in Fig. 1.

15

DESCRIPTION OF PREFERRED EMBODIMENT

In Fig. 1, the schematically illustrated packaging material has been given the generic reference numeral 10. The packaging material 10 comprises a core layer 11 of rigid, but foldable paper of conventional packaging quality, and outer, liquid-tight coatings 12 and 13 of polyethylene, preferably low density polyethylene (LDPE). Between the paper layer 11 and one of the two outer polyethylene coatings 12, there is provided an aluminium foil 14 (so-called Alifoil) serving as gas barrier which, by means of an interjacent layer 15 of adhesive, is bonded to that side of the core layer 11 which is intended to face inwards when the packaging material is reformed into packages.

25

As will be apparent from Fig. 1, the second outer polyethylene coating 13 of the packaging material 10 has an applied décor 16 of water-based printing ink which, using conventional printing technique, is applied in the desired decorative pattern on the outside of the polyethylene coating 13.

30 The packaging material 10 in Fig. 1 is produced according to the invention in the manner which is schematically illustrated in Fig. 2. In order to facilitate a comparison, the same parts in Fig. 2 have been given the same reference numerals as in Fig. 1.

35 A web 10' of plastic-coated paper is unwound from a magazine reel (not shown) in the direction of the arrow and is provided with a foil 14 of aluminium which serves as gas barrier and which, by means of an extruded

interjacent layer 15 of adhesive, is laminated to the one side of the web in connection with the web's being led through a nip between two rollers or cylinders 17 and 18.

5 The foil-clad web is thereafter led to an extrusion station in which the aluminium foil is covered with a film 12 of polyethylene, preferably low density polyethylene (LDPE), which is extruded on the outside of the aluminium foil 14 for the formation of the one outer plastic coating 12 of the packaging material 10.

10 The plastic-coated web is then subjected, for the purpose of promoting adhesion, to a surface treatment at 19 modifying its polarity, where the web's second outer coating 13 of polyethylene, preferably low density polyethylene, is surface modified by means of electric corona discharges in a per se known manner.

15 The corona-treated web is led further to a printing station 20 in which the web is, using conventional printing technique, provided with outer décor 16 of water-based printing ink which is applied in the desired pattern on the outside of the surface-modified outer polyethylene coating 13 of the web.

20 The web is finally led to an after treatment station at 21 in which the web, in accordance with the present invention, is led through the nip between two hot press rollers or press cylinders 22, 23, whereby the surface energy of the corona-treated, printing ink coated outer plastic coating 13 of the web is reduced at the same time as the plastic coating 13 is levelled out somewhat.

25 In a practical comparative experiment, a packaging material according to the invention for aseptic packages has proved susceptible to sterilization with a hydrogen peroxide consumption which is approximately 70 per cent lower than corresponding hydrogen peroxide consumption in a known packaging material which has not been subjected to an after treatment for the purpose of reducing surface energy, in sterilization
30 employing a bath of aqueous hydrogen peroxide in the previously described manner.

It will thus be apparent from the foregoing description that the present invention, in a simple manner and using simple means, makes for the production of a printing ink-decorated packaging material, in particular
35 for aseptic packages, with surprisingly advantageous properties.

Naturally, many modifications and alterations are possible without

departing from the inventive concept as herein disclosed. Such modifications and alterations, obvious to a person skilled in the art, thus lie within the spirit and scope of the inventive concept as this is defined by the appended Claims.

Fig.1

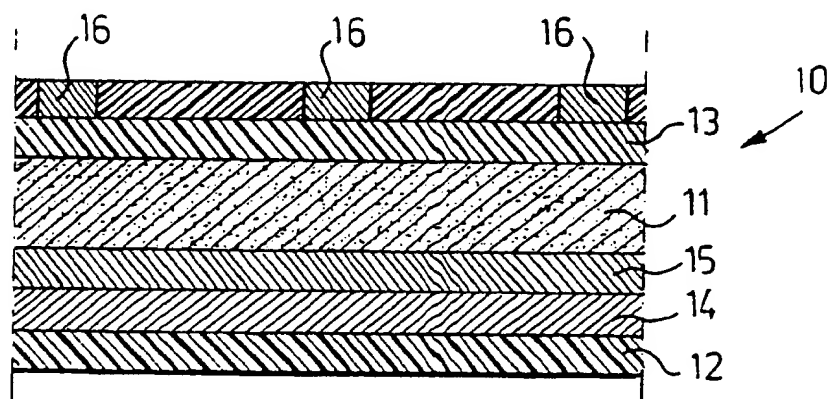
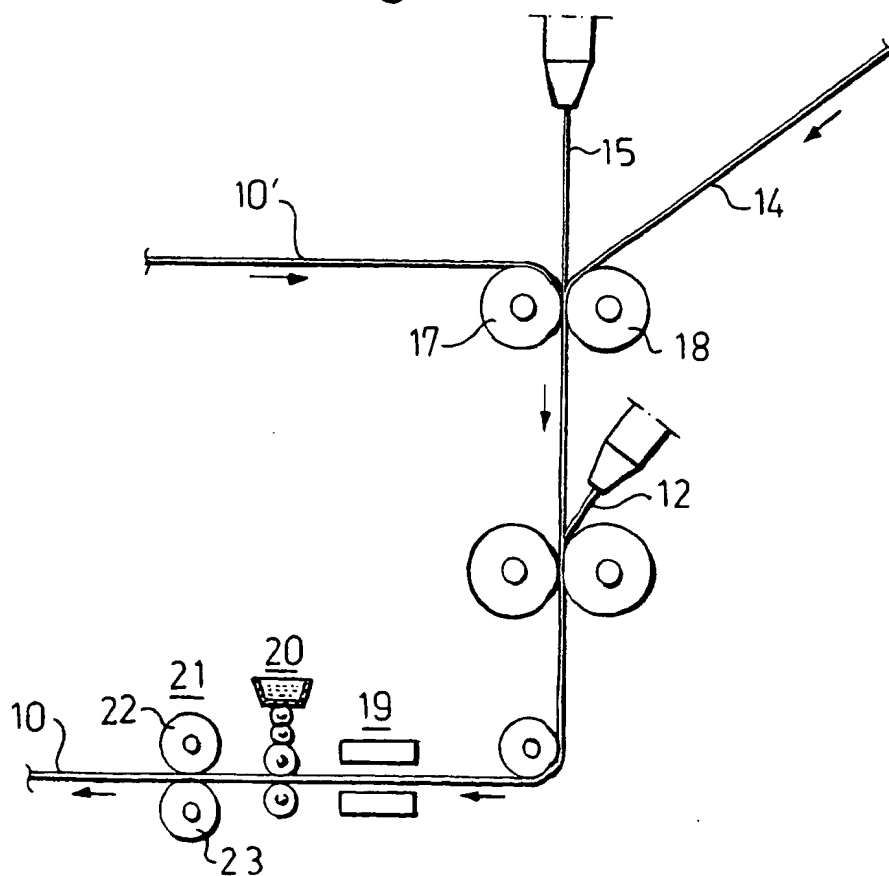


Fig.2



INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 98/00870

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B32B 27/10, B32B 27/16, B32B 27/32, B32B 31/26, B65B 55/10, C08J 7/06
// B41M 1/30

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B32B, B65B, C08J, B41M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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WPI, CAPLUS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3333032 A (BARRY L. DICKINSON), 25 July 1967 (25.07.67), figure 1, abstract --	1
A	WO 9414606 A1 (MOBIL OIL CORPORATION), 7 July 1994 (07.07.94), page 1, line 34 - page 2, line 4; page 15, line 18 - line 27, abstract -- -----	1

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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US 3333032 A 25/07/67 NONE

WO 9414606 A1 07/07/94 CA 2150821 A 07/07/94